Deutsche Akkreditierungsstelle

Annex to the Partial Accreditation Certificate D-K-15219-01-02 according to DIN EN ISO/IEC 17025:2018

Valid from: **12.01.2024**

Date of issue: 12.01.2024

This annex is a part of the accreditation certificate D-K-15219-01-00.

Holder of partial accreditation certificate:

imetrologie GmbH
Institut für Metrologie und Prozesstechnologie
Luitpoldstraße 3, 97264 Helmstadt

with the location

imetrologie GmbH
Institut für Metrologie und Prozesstechnologie
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The calibration laboratory meets the requirements of DIN EN ISO/IEC 17025:2018 to carry out the conformity assessment activities listed in this annex. The calibration laboratory meets additional legal and normative requirements, if applicable, including those in relevant sectoral schemes, provided that these are explicitly confirmed below.

The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration laboratories and they conform to the principles of DIN EN ISO 9001.

Calibration in the fields:

Thermodynamic quantities

Temperature quantities

- **Resistance thermometers** [b)]
- **Thermocouples** [b)]
- **Direct reading thermometers** [b)]
- **Temperature indicators and simulators** [b)]
- **Temperature transmitters, data loggers**
- **Fixed-point cells**
- **Liquid-in-glass thermometers**
- **Temperature block calibrators**
- **Climatic chambers (temperature)** [a)]
- **Calibration baths** [b)]

Humidity quantities

- **Devices for absolute humidity**
- **Devices for relative humidity**
- **Humidity generators and calibrators** [b)]
- **Climatic chambers (humidity)** [a)]

Mechanical quantities

- **Pressure** [b)]

Material testing machines (MTM)

- **Force (MTM)** [a)]
- **Extension (MTM)** [a)]

[a)] only on-site calibration
[b)] also on-site calibration

Within the measurands/calibration items marked with [*)], the calibration laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, to use calibration standards or equivalent calibration procedures listed here with different issue dates.

The calibration laboratory maintains a current list of all calibration standards/equivalent calibration procedures within the flexible scope of accreditation

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Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Temperature Fixed-point cells *)	0.01 °C	G-ITS-90, Part 2.2:2018 triple point of water	0.5 mK	Comparison with reference fixed-point cells with standard resistance thermometers
Standard platinum resistance thermo-meters (SPRT), direct reading thermometers with SPRT sensor	−196 °C	QMV 7.2/13 liquid nitrogen	15 mK	Comparison with reference thermometers
	−100 °C	QMV 7.2/13 in liquid baths	5.0 mK	
Standard platinum resistance thermo-meters (SPRT), direct reading thermometers with SPRT sensor *)	−189.3442 °C	G-ITS-90, Part 2.3:2021 triple point of argon	4.0 mK	Calibration at fixed-point temperatures of ITS 90
	−38.8344 °C	G-ITS-90, Part 2.4:2021 triple point of mercury	1.5 mK	
	0.01 °C	G-ITS-90, Part 2.2:2018 triple point of water	0.8 mK	
	29.7646 °C	G-ITS-90, Part 2.4:2021 melting point of gallium	1.5 mK	
	156.5985 °C	G-ITS-90, Part 2.4:2021 freezing point of indium	2.5 mK	
	231.928 °C	G-ITS-90, Part 2.4:2021 freezing point of tin	3.0 mK	
	419.527 °C	G-ITS-90, Part 2.4:2021 freezing point of zinc	3.0 mK	
	660.323 °C	G-ITS-90, Part 2.4:2021 freezing point of aluminium	7.0 mK	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Standard platinum resistance thermo-meters (SPRT), direct reading thermometers with SPRT sensor	−196 °C to 0 °C	QMV 7.2/30 in liquid bath and at fixed-point temperatures	20 mK	Calibration with determination of the characteristic The measurement uncertainty is the uncertainty of the characteristic in the specified range
	−100 °C to 0 °C		7.0 mK	
Standard platinum resistance thermo-meters (SPRT), direct reading thermometers with SPRT sensor *)	−196 °C to −189.3442 °C	EURAMET TG 01:2017	8.0 mK	Extrapolation
	−189.3442 °C to 0.01 °C	G-ITS-90, Part 5:2021 fixed-points: Ar, Hg, TPW	6.0 mK	Calibration at fixed-point temperatures with determination of the characteristic according to ITS-90 The measurement uncertainty is the uncertainty of the characteristic in the specified range
	−38.8344 °C to 29.7646 °C	G-ITS-90, Part 5:2021 fixed-points: Hg, TPW, Ga	2.0 mK	
	0 °C to 156.5985 °C	G-ITS-90, Part 5:2021 fixed-points: TPW, In	3.5 mK	
	0 °C to 231.928 °C	G-ITS-90, Part 5:2021 fixed-points: TPW, In, Sn	4.0 mK	
	0 °C to 419.527 °C	G-ITS-90, Part 5:2021 fixed-points: TPW, Sn, Zn	4.5 mK	
	0 °C to 660.323 °C	G-ITS-90, Part 5:2021 fixed-points: TPW, Sn, Zn, Al	8.0 mK	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Resistance thermometers, direct reading thermometers with resistance sensor *)	−196 °C	DKD-R 5-1:2018 liquid nitrogen	20 mK	Comparison with reference thermometers
	−38.8344 °C	DKD-R 5-1:2018 triple point of mercury	5 mK	
	0 °C	DKD-R 5-1:2018 ice point	5 mK	
	0.01 °C	DKD-R 5-1:2018 triple point of water	5 mK	
	29.7646 °C	DKD-R 5-1:2018 melting point of gallium	5 mK	
	156.5985 °C	DKD-R 5-1:2018 freezing point of indium	5 mK	
	−100 °C to −80 °C	DKD-R 5-1:2018 in liquid baths	6 mK	
	> −80 °C to 100 °C		5 mK	
	> 100 °C to 160 °C		6 mK	
	> 160 °C to 250 °C		10 mK	
	> 250 °C to 550 °C		20 mK	
	> 550 °C to 660 °C	DKD-R 5-1:2018 in furnaces mit with metal insert (sodium heat pipe)	50 mK	
	> 660 °C to 960 °C		1 K	
	−100 °C to 150 °C	DKD-R 5-1:2018 in dry block calibrators	15 mK	Comparison with reference thermometers
	> 150 °C to 200 °C		20 mK	
	> 200 °C to 300 °C		30 mK	
	> 300 °C to 400 °C		40 mK	
	> 400 °C to 500 °C		50 mK	
	> 500 °C to 600 °C		85 mK	
	>600 °C to 700 °C		0.10 K	
	−80 °C to 100 °C	DKD-R 5-1:2018 in climatic chambers or humidity generators	0.1 K	Comparison with reference thermometers
	> 100 °C to 180 °C		0.15 K	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Noble metal thermocouples, direct reading thermometers with noble metal thermo-couple sensor *)	−50 °C to 420 °C	DKD-R 5-3:2018 in liquid baths	0.4 K	Comparison with reference thermometers
	400 °C to 660 °C	DKD-R 5-3:2018 in furnaces mit with metal insert	0.5 K	
	> 660 °C to 1000 °C		0.8 K	
	> 1000 °C to 1085 °C		1.2 K	
	> 1085 °C to 1200 °C		1.5 K	
	> 1200 °C to 1324 °C		2.0 K	
	> 1324 °C to 1400 °C		3.0 K	
Base metal thermocouples, direct reading thermometers with base metal thermo-couple sensor *)	−196 °C	DKD-R 5-3:2018 in liquid nitrogen	0.3 K	Comparison with reference thermometers
	−100 °C to 200 °C	DKD-R 5-3:2018 in liquid baths	0.2 K	
	> 200 °C to 300 °C		0.2 K	
	> 300 °C to 400 °C		0.3 K	
	> 400 °C to 550 °C		0.6 K	
	> 400 °C to 660 °C	DKD-R 5-3:2018 in furnaces mit with metal insert	0.6 K	
	> 660 °C to 1100 °C		1.5 K	
	> 1100 °C to 1200 °C		3.0 K	
	> 1200 °C to 1300 °C		4.0 K	
	−100 °C to 300 °C	DKD-R 5-3:2018 in dry block calibrators	0.3 K	Comparison with reference thermometers
	> 300 °C to 400 °C		0.4 K	
	> 400 °C to 660 °C		0.7 K	
	> 660 °C to 1100 °C		1.7 K	
	> 1100 °C to 1200 °C		3.2 K	
Extension cables, compensation cables and reference junctions for thermocouples *)	−10 °C to 40 °C	DKD-R 5-3:2018 in liquid baths and at fixed-point temperatures	50 mK	Comparison with reference thermometers
direct reading thermometers with thermocouple sensor *)	−80 °C to 180 °C	DKD-R 5-3:2018 in climatic chambers or humidity generators	0.4 K	Comparison with reference thermometers

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Liquid-in glass thermometers *)	−80 °C to −58 °C	PTB testing instruction Volume 2:2003 in liquid bath	0.20 K	Comparison with reference thermometers
	> −58 °C to 110 °C		10 mK	
	> 110 °C to 205 °C		20 mK	
	> 205 °C to 420 °C		40 mK	
	> 420 °C to 550 °C		0.20 K	
Temperature block calibrators *)	−100 °C to 155 °C	DKD-R 5-4:2018	0.03 K	Comparison with reference thermometers
	> 155 °C to 200 °C		0.05 K	
	> 200 °C to 300 °C		0.06 K	
	> 300 °C to 400 °C		0.08 K	
	> 400 °C to 500 °C		0.10 K	
	> 500 °C to 600 °C		0.12 K	
	> 600 °C to 700 °C		0.15 K	
	> 700 °C to 960 °C		4 K	
	> 960 °C to 1200 °C		5 K	
Temperature transmitters with resistance sensor *)	−200 °C to 660 °C	see resistance thermometers	U_{PRT} + 0.1 K	U_{PRT} resp. U_{TC} is the expanded uncertainty of measurement of the calibration of the resistance sensor resp. thermocouple sensor
Temperature transmitters with thermocouple sensor *)	−200 °C to 1400 °C	see thermocouples	U_{TC} + 0.5 K	
Calibration baths	−100 °C to 300 °C	QMV 7.2/23	30 mK	Comparison with reference thermometers
Temperature indicators and simulators for resistance thermometers *)	−200 °C to 850 °C	DKD-R 5-5:2018	2 mK	Characteristics according to DIN EN IEC 60751:2023
for base metal thermocouples *)	−200 °C to 1300 °C	DKD-R 5-5:2018 with or without reference junction compensation	0.1 K	Characteristics according to DIN EN 60584:2014
for thermocouples type S, R *)	0 °C to 1768 °C		0.2 K	
for thermocouples type B *)	600 °C to 1820 °C		0.2 K	
Humidity generators	−10 °C to 95 °C	QMV 7.2/22	0.05 K	Comparison with reference thermometers

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Dew point temperature Dew point mirrors, dew point meters, measuring transducers	−20 °C to 60 °C	QMV 7.2/15	65 mK	Comparison with reference dew point mirror
	> 60 °C to 90 °C		85 mK	
Humidity generators, dew point production devices	−20 °C to 60 °C	QMV 7.2/22	50 mK	Comparison with reference dew point mirror
	> 60 °C to 90 °C		70 mK	
Relative humidity Hygrometers, hygrographs, measuring transducers *)	10 % to 95 %	DKD-R 5-8 in humidity generators air temperature: −10 °C to 70 °C	0.1 % + 0.0065 · *rH*	Comparison with reference thermo-meter and reference dew point mirror *rH* = measured value Measurement uncertainty expressed as absolute value of the relative humidity
	5 % to 98 %	DKD-R 5-8 in climatic chambers air temperature: 5 °C to 95 °C	0.2 % + 0.008 · *rH*	
Psychrometers	10 % to 95 %	QMV 7.2/15 in humidity generators air temperature: −10 °C to 70 °C	0.1 % + 0.0065 · *rH*	
	5 % to 98 %	QMV 7.2/15 in climatic chambers air temperature: 5 °C to 95 °C	0.2 % + 0.008 · *rH*	
Humidity generators, devices for generation of relative humidity	5 % to 98 %	QMV 7.2/22 air temperature: 5 °C to 95 °C	0.2 % + 0.006 · *rH*	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Pressure Absolute pressure p_{abs} *)	0.015 bar to 1.8 bar	DKD-R 6-1:2014 > 70 bar: method of calibration $p_{abs} = p_e + p_{amb}$	$2.2 \cdot 10^{-5} \cdot p_{abs} + 3.0$ µbar	Pressure medium : gas The measurement uncertainty of the vacuum gauge (U_{res}) has to be taken into account.
	> 1.8 bar to 7 bar		$2.3 \cdot 10^{-5} \cdot p_{abs} + 7.1$ µbar	
	> 7 bar to 70 bar		$3.1 \cdot 10^{-5} \cdot p_{abs} + 71$ µbar	
	> 70 bar to 101 bar		$5.4 \cdot 10^{-5} \cdot p_{abs} + 0.70$ mbar	Pressure medium : gas With gas/oil separation device. The measurement uncertainty of the barometer (U_{Baro}) has to be taken into account.
	> 101 bar to 201 bar		$5.7 \cdot 10^{-5} \cdot p_{abs} + 1.4$ mbar	
	> 201 bar to 1001 bar		$5.7 \cdot 10^{-5} \cdot p_{abs} + 3.5$ mbar	
Absolute pressure p_{abs} *)	1 bar; 2 bar to 101 bar	DKD-R 6-1:2014 method of calibration $p_{abs} = p_e + p_{amb}$	$5.4 \cdot 10^{-5} \cdot p_{abs} + 0.70$ mbar	Pressure medium: oil The measurement uncertainty of the barometer (U_{Baro}) has to be taken into account.
	> 101 bar to 201 bar		$5.7 \cdot 10^{-5} \cdot p_{abs} + 1.4$ mbar	
	> 201 bar to 1501 bar		$5.7 \cdot 10^{-5} \cdot p_{abs} + 3.5$ mbar	
Negative and positive gauge pressure p_e *)	−1.0 bar to −0.015 bar	DKD-R 6-1:2014	$4.9 \cdot 10^{-5} \cdot \lvert p_e \rvert + 5.3$ µbar	Pressure medium : gas
	> −0.015 bar to 0.015 bar		7.5 µbar	
	> 0.015 bar to 1.8 bar		$2.0 \cdot 10^{-5} \cdot p_e + 3.0$ µbar	
	> 1.8 bar to 7.0 bar		$2.0 \cdot 10^{-5} \cdot p_e + 7.1$ µbar	
	> 7.0 bar to 70 bar		$3.0 \cdot 10^{-5} \cdot p_e + 71$ µbar	
	> 70 bar to 100 bar		$5.4 \cdot 10^{-5} \cdot p_e + 0.70$ mbar	Pressure medium : gas With gas/oil separation device.
	> 100 bar to 200 bar		$5.7 \cdot 10^{-5} \cdot p_e + 1.4$ mbar	
	> 200 bar to 1000 bar		$5.7 \cdot 10^{-5} \cdot p_e + 3.5$ mbar	
Positive gauge pressure p_e *)	0 bar; 1 bar to 100 bar	DKD-R 6-1:2014	$5.4 \cdot 10^{-5} \cdot p_e + 0.70$ mbar	Pressure medium: oil
	> 100 bar to 200 bar		$5.7 \cdot 10^{-5} \cdot p_e + 1.4$ mbar	
	> 200 bar to 1500 bar		$5.7 \cdot 10^{-5} \cdot p_e + 3.5$ mbar	

On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Temperatur				
Resistance thermometers, direct reading thermometers with resistance sensor *)	−100 °C to 150 °C	DKD-R 5-1:2018 in dry block calibrators	65 mK	Comparison with reference thermometers
	> 150 °C to 200 °C		70 mK	
	> 200 °C to 300 °C		80 mK	
	> 300 °C to 400 °C		90 mK	
	> 400 °C to 500 °C		0.10 K	
	> 500 °C to 600 °C		0.14 K	
	> 600 °C to 700 °C		0.16 K	
thermocouples, direct reading thermometers with thermocouple sensor *)	−100 °C to 300 °C	DKD-R 5-3:2018 in dry block calibrators	0.4 K	Comparison with reference thermometers
	> 300 °C to 400 °C		0.5 K	
	> 400 °C to 660 °C		0.8 K	
	> 660 °C to 1100 °C		1.7 K	
	> 1100 °C to 1200 °C		3.2 K	
Measuring locations in climatic chambers with air circulation *)	−90 °C to −50 °C	DKD-R 5-7:2018 method C measurement in air	0.15 K	Comparison with reference thermometers
	> −50 °C to < 0 °C		0.12 K	
	0 °C to 100 °C		0.08 K	
	> 100 °C to 150 °C		0.13 K	
	> 150 °C to 200 °C		0.20 K	
	> 200 °C to 350 °C		0.33 K	
	> 350 °C to 500 °C		0.50 K	
Climatic chambers with air circulation *)	−90 °C to < 0 °C	DKD-R 5-7:2018 method A and B measurement in air	0.4 K	
	0 °C to 100 °C		0.2 K	
	> 100 °C to 150 °C		0.4 K	
	> 150 °C to 400 °C		0.6 K	
	> 400 °C to 500 °C		1.0 K	
Measuring locations in climatic chambers without air circulation *)	−90 °C to < 0 °C	DKD-R 5-7:2018 method C measurement in air	0.4 K	
	0 °C to 100 °C		0.3 K	
	> 100 °C to 150 °C		0.4 K	
	> 150 °C to 200 °C		0.5 K	
	> 200 °C to 350 °C		0.8 K	
Climatic chambers without air circulation *)	−90 °C to 150 °C	DKD-R 5-7:2018 method A and B measurement in air	0.6 K	
	> 150 °C to 350 °C		0.8 K	

On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Humidity generators	5 °C to 95 °C	QMV 7.2/22	0.05 K	Comparison with reference thermometers
Calibration baths	−100 °C to 300 °C	QMV 7.2/23	30 mK	Comparison with reference thermometers
Temperature indicators and simulators for resistance thermometers *)	−200 °C to 850 °C	DKD-R 5-5:2018	0.1 K	Characteristics according to DIN EN 60751:2023
for noble metal thermocouples *)	0 °C to 1820 °C	DKD-R 5-5:2018 with or without reference junction compensation	0.6 K	Characteristics according to DIN EN 60584:2014
for base metal thermocouples *)	−200 °C to 500 °C		0.3 K	
	> 500 °C to 1370 °C		0.5 K	
Relative Feuchte Humidity generators, devices for generation of relative humidity	5 % to 98 %	QMV 7.2/22 air temperature: 5 °C to 95 °C	0.2 % + 0.006 · *rH*	VComparison with reference thermometer and reference dew point mirror *rH* = measured value Measurement uncertainty expressed as absolute value of the relative humidity
Climatic chambers with air circulation *)	5 % to 30 %	DKD-R 5-7:2018 method A and B air temperature: 5 °C to 70 °C	0.8 %	Measurement uncertainty expressed as absolute value of the relative humidity
	> 30 % to 60 %		1.2 %	
	> 60 % to 95 %		1.6 %	
	5% to 95 %	DKD-R 5-7:2018 method A and B air temperature: > 70 °C to 95 °C	2.1 %	
Measuring locations in climatic chambers with air circulation *)	5 % to 30 %	DKD-R 5-7:2018 method C air temperature: 5 °C to 70 °C	0.6 %	
	> 30 % to 60 %		0.8 %	
	> 60 % to 95 %		1.0 %	
	5 % to 95 %	DKD-R 5-7:2018 method C air temperature: > 70 °C to 95 °C	1.8 %	

On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Force (MTM) Force measuring devices for Material Testing Machines according to DIN 51220:2003 *)	1 N to 500 N	DIN EN ISO 7500-1:2018 Sheet 1:1999 Sheet 2:1999 Sheet 3:1999	0.10 %	Mass stacks (compression and tensile)
	50 N to 200 kN		0.12 %	Force transducer (compression and tensile)
Extension (MTM) Lengt variation measuring device for Material Testing Machines according to DIN 51220:2003 *)	20 mm to 1200 mm	DIN EN ISO 9513:2013	$2.0 \cdot 10^{-3} \cdot l$	Measuring principle: incremental l = measured extension
Pressure Absolute pressure p_{abs} *)	0.015 bar to 1.8 bar	DKD-R 6-1:2014 > 70 bar: method of calibration $p_{abs} = p_e + p_{amb}$	$2.3 \cdot 10^{-5} \cdot p_{abs} + 3.1$ µbar	Pressure medium : gas The measurement uncertainty of the vacuum gauge (U_{res}) has to be taken into account.
	> 1.8 bar to 7 bar		$2.4 \cdot 10^{-5} \cdot p_{abs} + 7.3$ µbar	
	> 7 bar to 70 bar		$3.2 \cdot 10^{-5} \cdot p_{abs} + 73$ µbar	
	> 70 bar to 101 bar		$6.0 \cdot 10^{-5} \cdot p_{abs} + 0.77$ mbar	Pressure medium : gas With gas/oil separation device. The measurement uncertainty of the barometer (U_{Baro}) has to be taken into account.
	> 101 bar to 201 bar		$6.3 \cdot 10^{-5} \cdot p_{abs} + 1.5$ mbar	
	> 201 bar to 1001 bar		$6.3 \cdot 10^{-5} \cdot p_{abs} + 3.9$ mbar	
Absolute pressure p_{abs} *)	1 bar; 2 bar to 101 bar	DKD-R 6-1:2014 method of calibration $p_{abs} = p_e + p_{amb}$	$6.0 \cdot 10^{-5} \cdot p_{abs} + 0.77$ mbar	Pressure medium : gas The measurement uncertainty of the barometer (U_{Baro}) has to be taken into account.
	> 101 bar to 201 bar		$6.3 \cdot 10^{-5} \cdot p_{abs} + 1.5$ mbar	
	> 201 bar to 1501 bar		$6.3 \cdot 10^{-5} \cdot p_{abs} + 3.9$ mbar	
Negative and positive gauge pressure p_e *)	−1.0 bar to −0.015 bar	DKD-R 6-1:2014	$5.1 \cdot 10^{-5} \cdot \lvert p_e \rvert + 5.4$ µbar	Pressure medium : gas
	> −0.015 bar to 0.015 bar		7.5 µbar	
	> 0.015 bar to 1.8 bar		$2.1 \cdot 10^{-5} \cdot p_e + 3.1$ µbar	
	> 1.8 bar to 7.0 bar		$2.1 \cdot 10^{-5} \cdot p_e + 7.3$ µbar	
	> 7.0 bar to 70 bar		$3.1 \cdot 10^{-5} \cdot p_e + 73$ µbar	
	> 70 bar to 100 bar		$6.0 \cdot 10^{-5} \cdot p_e + 0.77$ mbar	Pressure medium : gas With gas/oil separation device.
	> 100 bar to 200 bar		$6.3 \cdot 10^{-5} \cdot p_e + 1.5$ mbar	
	> 200 bar to 1000 bar		$6.3 \cdot 10^{-5} \cdot p_e + 3.9$ mbar	
Positive gauge pressure p_e *)	0 bar; 1 bar to 100 bar	DKD-R 6-1:2014	$6.0 \cdot 10^{-5} \cdot p_e + 0.77$ mbar	Pressure medium: oil
	> 100 bar to 200 bar		$6.3 \cdot 10^{-5} \cdot p_e + 1.5$ mbar	
	> 200 bar to 1500 bar		$6.3 \cdot 10^{-5} \cdot p_e + 3.9$ mbar	

Abbreviations used:

CMC	Calibration and measurement capabilities
DIN	Deutsches Institut für Normung e.V. (German Institute for Standardization)
DKD-R	Guideline of Deutscher Kalibrierdienst (DKD), published by Physikalisch-Technische Bundesanstalt
EN	Europäische Norm (European Standard)
EURAMET	European Association of National Metrology Institutes
QMV	Calibration procedure of imetrologie GmbH Institut für Metrologie und Prozesstechnologie
G-ITS-90, Part 2.2	BIPM-Guide to the Realization of the ITS-90, Triple Point of Water
G-ITS-90, Part 2.3	BIPM-Guide to the Realization of the ITS-90, Cryogenic Fixed Points
G-ITS-90, Part 2.4	BIPM-Guide to the Realization of the ITS-90, Metal Fixed Points for Contact Thermometry
G-ITS-90, Part 5	BIPM-Guide to the Realization of the ITS-90, Platinum Resistance Thermometry
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization

Deutsche Akkreditierungsstelle

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Annex to the Partial Accreditation Certificate D-K-15219-01-01 according to DIN EN ISO/IEC 17025:2018

Valid from: **12.01.2024**

Date of issue: 12.01.2024

This annex is a part of the accreditation certificate D-K-15219-01-00.

Holder of partial accreditation certificate:

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Institut für Metrologie und Prozesstechnologie
Luitpoldstraße 3, 97264 Helmstadt

with the location

imetrologie GmbH
Institut für Metrologie und Prozesstechnologie
Luitpoldstraße 3, 97264 Helmstadt

The calibration laboratory meets the requirements of DIN EN ISO/IEC 17025:2018 to carry out the conformity assessment activities listed in this annex. The calibration laboratory meets additional legal and normative requirements, if applicable, including those in relevant sectoral schemes, provided that these are explicitly confirmed below.

The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration laboratories and they conform to the principles of DIN EN ISO 9001.

Calibration in the fields:

Electrical quantities

DC and low frequency quantities

- **DC voltage**
- **DC current**
- **DC resistance**
- **AC voltage**
- **AC current**

Time and frequency

- **Frequency**

This certificate annex is only valid together with the written accreditation certificate and reflects the status as indicated by the date of issue. The current status of any given scope of accreditation can be found in the directory of accredited bodies maintained by Deutsche Akkreditierungsstelle GmbH at https://www.dakks.de.

Abbreviations used: see last page

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
DC voltage	0 V to 100 mV		$0.4\ \mu V + 3.4 \cdot 10^{-6} \cdot U$	U = measured value
	> 100 mV to 220 mV		$0.3\ \mu V + 1.7 \cdot 10^{-6} \cdot U$	
	> 0.22 V to 2.2 V		$1.0\ \mu V + 1.4 \cdot 10^{-6} \cdot U$	
	> 2.2 V to 22 V		$6.0\ \mu V + 1.7 \cdot 10^{-6} \cdot U$	
	> 22 V to 220 V		$42\ \mu V + 2.4 \cdot 10^{-6} \cdot U$	
	> 220 V to 1100 V		$43\ \mu V + 5.9 \cdot 10^{-6} \cdot U$	
DC current	0 A to 220 µA		$50\ nA + 15 \cdot 10^{-6} \cdot I$	I = measured value
	> 220 µA to 22 mA		$0.1\ \mu A + 13 \cdot 10^{-6} \cdot I$	
	> 22 mA to 220 mA		$1.0\ \mu A + 20 \cdot 10^{-6} \cdot I$	
	> 220 mA to 2.2 A		$10\ \mu A + 35 \cdot 10^{-6} \cdot I$	
DC resistance Resistors	1 Ω	standard resistors in liquid baths 23 °C ± 0.01 K	$3 \cdot 10^{-7} \cdot R$	R = measured value resistors as reference standards
	10 Ω		$3 \cdot 10^{-7} \cdot R$	
	25 Ω		$3 \cdot 10^{-7} \cdot R$	
	100 Ω		$3 \cdot 10^{-7} \cdot R$	
	400 Ω		$3 \cdot 10^{-7} \cdot R$	
	1 kΩ		$5 \cdot 10^{-7} \cdot R$	
	10 kΩ		$3 \cdot 10^{-7} \cdot R$	
Fixed values	0 Ω		2 µΩ	4-wire-short
	1 Ω; 1.9 Ω		$30 \cdot 10^{-6} \cdot R$	R = measured value
	10 Ω; 19 Ω		$13 \cdot 10^{-6} \cdot R$	
	100 Ω; 190 Ω;1 kΩ; 1.9 kΩ		$5 \cdot 10^{-6} \cdot R$	
	10 kΩ; 19 kΩ; 100 kΩ; 190 kΩ		$5 \cdot 10^{-6} \cdot R$	
	1 MΩ; 1.9 MΩ		$9 \cdot 10^{-6} \cdot R$	
	10 MΩ		$15 \cdot 10^{-6} \cdot R$	
	19 MΩ; 100 MΩ		$50 \cdot 10^{-6} \cdot R$	
Ranges	1 Ω to < 20 Ω		$15 \cdot 10^{-6} \cdot R$	
	20 Ω to < 200 kΩ		$8 \cdot 10^{-6} \cdot R$	
	200 kΩ to < 20 MΩ		$12 \cdot 10^{-6} \cdot R$	
	20 MΩ to < 200 MΩ		$60 \cdot 10^{-6} \cdot R$	
	200 MΩ to < 2 GΩ		$10\ k\Omega + 1.7 \cdot 10^{-4} \cdot R$	
	2 GΩ to 20 GΩ		$1.0\ M\Omega + 1.3 \cdot 10^{-3} \cdot R$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC voltage	2 mV	10 Hz	$2.4 \cdot 10^{-3} \cdot U$	U = measured value
		20 Hz; 40 Hz; 100 Hz; 1 kHz; 10 kHz; 20 kHz	$2.2 \cdot 10^{-3} \cdot U$	
		50 kHz; 70 kHz; 100 kHz	$3.1 \cdot 10^{-3} \cdot U$	
		200 kHz	$6.1 \cdot 10^{-3} \cdot U$	
		500 kHz; 1 MHz	$13 \cdot 10^{-3} \cdot U$	
	10 mV	10 Hz	$0.67 \cdot 10^{-3} \cdot U$	
		20 Hz; 40 Hz;100 Hz; 1 kHz; 10 kHz; 20 kHz	$0.52 \cdot 10^{-3} \cdot U$	
		50 kHz; 70 kHz; 100 kHz	$1.1 \cdot 10^{-3} \cdot U$	
		200 kHz	$2.1 \cdot 10^{-3} \cdot U$	
		500 kHz; 1 MHz	$4.8 \cdot 10^{-3} \cdot U$	
	100 mV	10 Hz	$0.37 \cdot 10^{-3} \cdot U$	
		20 Hz; 40 Hz; 100 Hz; 1 kHz; 10 kHz; 20 kHz	$0.17 \cdot 10^{-3} \cdot U$	
		50 kHz; 70 kHz; 100 kHz	$0.49 \cdot 10^{-3} \cdot U$	
		200 kHz	$0.9 \cdot 10^{-3} \cdot U$	
		500 kHz; 1 MHz	$3.2 \cdot 10^{-3} \cdot U$	
	1 V	10 Hz	$0.29 \cdot 10^{-3} \cdot U$	
		20 Hz	$0.11 \cdot 10^{-3} \cdot U$	
		40 Hz; 100 Hz; 1 kHz; 10 kHz; 20 kHz	$60 \cdot 10^{-6} \cdot U$	
		50 kHz; 70 kHz; 100 kHz	$0.12 \cdot 10^{-3} \cdot U$	
		200 kHz	$0.42 \cdot 10^{-3} \cdot U$	
		500 kHz; 1 MHz	$2.1 \cdot 10^{-3} \cdot U$	
	4 V; 6 V; 8 V; 12 V; 15 V; 19 V	1 kHz; 10 kHz	$60 \cdot 10^{-6} \cdot U$	
		100 kHz	$0.14 \cdot 10^{-3} \cdot U$	
	10 V	10 Hz	$0.29 \cdot 10^{-3} \cdot U$	
		20 Hz	$0.11 \cdot 10^{-3} \cdot U$	
		40 Hz; 100 Hz; 1 kHz; 10 kHz; 20 kHz	$50 \cdot 10^{-6} \cdot U$	
		50 kHz; 70 kHz; 100 kHz	$0.11 \cdot 10^{-3} \cdot U$	
		200 kHz	$0.32 \cdot 10^{-3} \cdot U$	
		500 kHz; 1 MHz	$1.9 \cdot 10^{-3} \cdot U$	
	100 V	10 Hz	$0.29 \cdot 10^{-3} \cdot U$	
		20 Hz	$0.11 \cdot 10^{-3} \cdot U$	
		40 Hz; 100 Hz; 1 kHz; 10 kHz; 20 kHz	$70 \cdot 10^{-6} \cdot U$	
		50 kHz; 70 kHz; 100 kHz	$0.19 \cdot 10^{-3} \cdot U$	
	1000 V	55 Hz; 500 Hz; 1 KHz	$80 \cdot 10^{-6} \cdot U$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC current	100 µA; 200 µA	10 Hz; 20 Hz	$0.42 \cdot 10^{-3} \cdot I$	I = measured value
		40 Hz; 500 Hz; 1 kHz	$0.20 \cdot 10^{-3} \cdot I$	
		5 kHz	$0.42 \cdot 10^{-3} \cdot I$	
		10 kHz	$1.8 \cdot 10^{-3} \cdot I$	
	0.5 mA; 1 mA; 2 mA; 5 mA; 10 mA; 15 mA; 20 mA	10 Hz; 20 Hz	$0.34 \cdot 10^{-3} \cdot I$	
		40 Hz; 500 Hz; 1 kHz	$0.18 \cdot 10^{-3} \cdot I$	
		5 kHz	$0.43 \cdot 10^{-3} \cdot I$	
		10 kHz	$2.5 \cdot 10^{-3} \cdot I$	
	0.5 A; 1 A; 2 A	20 Hz; 40 Hz; 500 Hz; 1 kHz	$0.32 \cdot 10^{-3} \cdot I$	
		5 kHz	$0.62 \cdot 10^{-3} \cdot I$	
		10 kHz	$7.4 \cdot 10^{-3} \cdot I$	
Frequency Sources	1 Hz to < 40 Hz		$0.51 \cdot 10^{-3} \cdot f$	f = measured value
	40 Hz to < 1 MHz		$0.11 \cdot 10^{-3} \cdot f$	
	1 MHz to 300 MHz		$8.0 \cdot 10^{-6} \cdot f$	
Measuring instruments	1 Hz to < 10 Hz		$0.52 \cdot 10^{-3} \cdot f$	
	10 Hz to 1.2 MHz		$0.12 \cdot 10^{-3} \cdot f$	

Abbreviations used:

CMC Calibration and measurement capabilities
DIN Deutsches Institut für Normung e.V. (German Institute for Standardization)
EN Europäische Norm (European Standard)
IEC International Electrotechnical Commission
ISO International Organization for Standardization

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Accreditation

The Deutsche Akkreditierungsstelle attests with this **Accreditation Certificate** that the calibration laboratory

imetrologie GmbH
Institut für Metrologie und Prozesstechnologie
Luitpoldstraße 3, 97264 Helmstadt

meets the requirements of DIN EN ISO/IEC 17025:2018 for the conformity assessment activities specified in the following partial accreditation certificates. This includes additional existing legal and normative requirements for the calibration laboratory, including those in relevant sectoral schemes, provided that these are explicitly confirmed in the annexes to the partial accreditation certificates listed below.

D-K-15219-01-01
D-K-15219-01-02

The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration laboratories and they conform to the principles of DIN EN ISO 9001.

This accreditation was issued in accordance with Art. 5 Para. 1 Sentence 2 of Regulation (EC) 765/2008, after an accreditation procedure was carried out in compliance with the minimum requirements of DIN EN ISO/IEC 17011 and on the basis of a review and decision of the appointed accreditation committees.

This accreditation certificate consists of this cover sheet, the reverse side of the cover sheet and the following annex. It only applies in connection with the partial accreditation certificates listed above and the notices referred to there.

Registration number of the certificate: **D-K-15219-01-00**

Berlin, 12.01.2024
Dipl.-Wirtsch.-Ing. (BA) Tim Harnisch
Head of Technical Unit

Translation issued:
12.01.2024
Dipl.-Wirtsch.-Ing. (BA) Tim Harnisch
Head of Technical Unit

The certificate together with the annex reflects the status as indicated by the date of issue. The current status of any given scope of accreditation can be found in the directory of accredited bodies maintained by Deutsche Akkreditierungsstelle GmbH (www.dakks.de).

This document is a translation. The definitive version is the original German accreditation certificate.

See notes overleaf

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60327 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The Deutsche Akkreditierungsstelle GmbH (DAkkS) is the entrusted national accreditation body of the Federal Republic of Germany according to § 8 section 1 AkkStelleG in conjunction with § 1 section 1 AkkStelleGBV. DAkkS is designated as the national accreditation authority by Germany according to Art. 4 Para. 4 of Regulation (EC) 765/2008 and clause 4.7 of DIN EN ISO/IEC 17000.

Pursuant to Art. 11 section 2 of Regulation (EC) 765/2008, the accreditation certificate shall be recognised as equivalent by the national authorities within the scope of this Regulation as well as by the WTO member states that have committed themselves in bilateral or multilateral mutual agreements to recognise the certificates of accreditation bodies that are members of ILAC or IAF as equivalent.

DAkkS is a signatory to the multilateral agreements for mutual recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Co-operation (ILAC).

The up-to-date state of membership can be retrieved from the following websites:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

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Accreditation

The Deutsche Akkreditierungsstelle attests with this **Partial Accreditation Certificate** that the calibration laboratory

imetrologie GmbH
Institut für Metrologie und Prozesstechnologie
Luitpoldstraße 3, 97264 Helmstadt

meets the requirements according to DIN EN ISO/IEC 17025:2018 for the conformity assessment activities listed in the annex to this certificate. This includes additional existing legal and normative requirements for the calibration laboratory, including those in relevant sectoral schemes, provided they are explicitly confirmed in the annex to this certificate.

The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration laboratories and they conform to the principles of DIN EN ISO 9001.

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This partial accreditation certificate only applies in connection with the notice of 12.01.2024 with accreditation number D-K-15219-01.
It consists of this cover sheet, the reverse side of the cover sheet and the following annex with a total of 4 pages.

Registration number of the partial accreditation certificate: **D-K-15219-01-01**
It is a part of the accreditation certificate: D-K-15219-01-00.

Berlin, 12.01.2024 Dr. Florian Witt
Head of Technical Unit

Translation issued: 12.01.2024 Dr. Florian Witt
Head of Technical Unit

The certificate together with the annex reflects the status as indicated by the date of issue. The current status of any given scope of accreditation can be found in the directory of accredited bodies maintained by Deutsche Akkreditierungsstelle GmbH (www.dakks.de).

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This partial accreditation certificate only applies in connection with the notice of 12.01.2024 with accreditation number D-K-15219-01.
It consists of this cover sheet, the reverse side of the cover sheet and the following annex with a total of 13 pages.

Registration number of the partial accreditation certificate: **D-K-15219-01-02**
It is a part of the accreditation certificate: D-K-15219-01-00.

Berlin, 12.01.2024
Dipl.-Wirtsch.-Ing.(BA) Tim Harnisch
Head of Technical Unit

Translation issued:
12.01.2024
Dipl.-Wirtsch.-Ing. (BA) Tim Harnisch
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